CHIP STRUCTURE WITH BUMPS AND A PROCESS FOR FABRICATING THE SAME

DESCRIPTION

CROSS-REFERENCE TO RELATED APPLICATION

[Para 1] This application is a divisional of a prior application serial no. 10/065,632, filed November 5, 2002, which claims the priority benefit of Taiwan application serial no. 91100094, filed on Jan. 7, 2002.

BACKGROUND OF THE INVENTION

[Para 2] Field of the Invention:

[Para 3] This invention relates in general to a chip structure with bumps and a process for fabricating the chip, and more specifically relates to bumps made of specific material so that the bumping process is simplified and the manufacturing cost is reduced.

[Para 4] Description of Related Art:

[Para 5] Recently, following the high-development of information technology, electronic products are commonly used in the public. The design fashions of various electronic products trends also generally towards lightness, thinness, shortness and smallness. Therefore, as far as the field of semiconductor packages is concerned, a lot of package structures are provided in high density type. In some fields of package, bumps are formed on a chip to perform Flip Chip Packaging or Tape Carrier Packaging. Bumps are generally divided into 2 types, one is made of solder, the other is made of gold. The bumps made of gold in prior art will be described as follows.

[Para 6] Fig. 1 to Fig. 5 are schematic cross-sectional views showing the progression of steps for producing a bump made of gold in accordance with a conventional method.

[Para 7] As shown in Fig. 1, a chip 110 which has an active surface 112 and bonding pads 116 (only one bonding pad is shown) is provided. The bonding pads 116 are formed on the active surface. A passivation layer 114 is formed on the active surface 112 and exposes the bonding pads 116 so that the chip 110 is electrically connected to other outside circuit (not shown) through the bonding pads 116. The Under Bump Metal process is followed to form a barrier layer 120 on the active surface 112 of the chip 110 by sputtering method. The barrier layer 120 covers bonding pads 116 and the passivation layer 114. The material of the barrier layer 120 is for example TiW etc., wherein a thickness of the barrier is about thousands of angstrom. Then a seed layer 130 is formed on the barrier layer 120 by electrical plating or sputtering method. After that, the Under Bump Metal 140 is completed. The material of seed layer 130 is for example gold, wherein a thickness of the seed layer is about 1000 angstrom, and the Under Bump Metal 140 is composed of the barrier layer 120 and seed layer 130.

[Para 8] As shown in Fig. 2, a photolithography process is performed. A photo resist layer 150 is formed on the seed layer 130. After the photo resist layer 150 has been exposed and developed, a pattern (not shown) is transferred to the photo resist layer 150 so that openings 152 (only one opening is shown) which exposes bonding pads 116 are formed in the photo resist layer 150.

[Para 9] As shown in Fig. 3, a bumping process follows. Bumps 160 (only one bump is shown) are filled in the openings 152 of the photo resist layer 150, wherein the material of the bump 160 is gold.

[Para 10] Referring to Fig. 3 and Fig. 4, the photo resist layer 150 is removed from the surface of the seed layer 130.

[Para 11] Referring to Fig. 4 and Fig. 5, the Under Bump Metal 140 which is exposed is removed by an etching method. Then an annealing process is

performed so that the metal ions with defects which are in the bumps 160 are rearranged to be in a stable state.

[Para 12] As it is described above, the bumping process is complicated, high cost and is not so effective a manufacturing process.

SUMMARY OF THE INVENTION

[Para 13] According to the foregoing description, an object of this invention is to provide a structure and a fabricating process of a bump so that the bumping process is simplified and cost down by changing the material of the bumps.

[Para 14] To attain the foregoing and other aspects, the present invention proposes a chip structure with bumps comprising: a chip and at least a bump. Wherein the chip has an active surface and at least a bonding pad, and the bonding pad is formed on the active surface. The bump is disposed on the bonding pad, and the bump comprises a medium layer, a bump body and a bump body passivation layer. The medium layer is disposed on the bonding pad, and a material of the medium layer includes zinc. A bump body is disposed on the medium layer, and a material of the bump body includes nickel. A bump body passivation layer covers the bump body except for a portion of the bump body that connects to the medium layer, wherein a material of the bump body passivation layer includes gold.

[Para 15] Also to attain the foregoing and other aspects, the present invention proposes a process for fabricating a chip with bumps comprising the following steps. First providing a chip that has an active surface and at least a bonding pad, wherein the bonding pad exposes the active surface. Then performing an activation step, depositing a medium layer on the bonding pad. Forming at least a bump body on the medium layer in an electricless plating way, and forming a bump body passivation layer covering the bump body except for a portion of the bump body that connects to the medium layer.

[Para 16] According to a preferred embodiment of the present invention, the material of the bump body is nickel, and the material of the bump body

passivation layer is gold. The height of the bump body is about 5 to 10 microns, and the height of the bump body passivation layer is about 1 to 3 microns. The bump body and the bump body passivation layer are formed by electricless plating.

[Para 17] As it is described above, the feature of the present invention is to change the material of the bumps so that the bumps can be formed on the bonding pads of a chip in a simplified manufacturing process.

BRIEF DESCRIPTION OF THE DRAWINGS

[Para 18] While the specification concludes with claims particularly pointing out and distinctly claiming the subject matter which is regarded as the invention, the objects and features of the invention and further objects, features and advantages thereof will be better understood from the following description taken in connection with the accompanying drawings.

[Para 19] FIG. 1 through Fig. 5 are schematic cross-sectional views showing the progression of steps for producing a bump made of gold in accordance with a conventional method.

[Para 20] FIG. 6 and Fig. 7 are schematic cross-sectional views showing the progression of steps for producing a bump in accordance with a preferred embodiment of the present invention.

[Para 21] Fig. 8 through Fig. 10 are schematic cross-sectional views showing the progression of steps for producing a bump in accordance with another preferred embodiment of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

[Para 22] FIG. 6 and Fig. 7 are schematic cross-sectional views showing the progression of steps for producing a bump in accordance with a preferred embodiment of the present invention.

[Para 23] With reference to Fig. 6, a chip 210 which has an active surface 212 and at least a bonding pad 216 (only one bonding pad is shown) is provided.

The bonding pad 216 is formed on the active surface 212. A passivation layer 214 is formed on the active surface 212 and exposes the bonding pad 216 so that the chip 210 is electrically connected to other outside circuit (not shown) through the bonding pad 216.

[Para 24] A bumping process which includes steps of producing a bump body and a bump body passivation layer follows. In the step of producing a bump body, at least a bump body 220 is formed by electricless plating to be electrically connected to the bonding pad 216. It is accomplished by following steps. First, an activation step is performed. During the activation step, the chip 210 is dipped into a zinc ions containing solution, then zinc is deposited on the bonding pad 216 of the chip 210 to form a medium layer 228, wherein a material of the medium layer includes zinc. Since zinc is utilized to be an activator before the following electricless plating, the deposition thickness of zinc doesn't need to be thick. Then an electricless plating step is performed. The chip 210 is dipped into a nickel ions containing solution, then nickel is formed on the medium layer 228 on the chip 210 in an electricless plating way. Nickel is deposited on zinc so that a bump body 220 is formed. The size of the bump body 220 can be controlled by the dipping time in nickel ions containing solution. Therefore, the bump body 220 is connected to the bonding pad 216 through the medium layer 228, wherein a material of the bump body 220 includes nickel.

[Para 25] With reference to Fig. 7, a step of producing a bump body passivation is performed.

[Para 26] A bump body passivation 230 is formed to cover the bump body 220 except for a portion of the bump body 220 that connects to the medium layer 228. The material of the bump body passivation layer 230 is gold so that the oxidization of the bump body 220 (nickel) can be prevented. After these steps, the bump 240, which comprises the bump body 220 and the bump body passivation layer 230, is accomplished. Since the hardness of the bump body 220 whose material is nickel is relatively high, the height of the bump 240 only needs to be 5 to 10 microns to perform the Tape Carrier Packing

process. The thickness of the bump body passivation layer 230 is about 1 to 3 microns.

[Para 27] Comparing this preferred embodiment with the prior art, the bumping process described above can eliminate the Under Bump Metal process, photolithography and etching process. Furthermore, it is not necessary to form the bump using electrical plating. Therefore, the bumping process of the present invention is simplified and the manufacturing cost is down.

[Para 28] Fig. 8 through Fig. 10 are schematic cross-sectional views showing the progression of steps for producing a bump in accordance with another preferred embodiment of the present invention. In the previous embodiment, the bump body is formed on a chip in an electricless plating way. Furthermore, a photolithography process can also be added to control the shape of the bump.

[Para 29] With reference to Fig. 8, a photolithography process is performed after a chip 310 is provided.

[Para 30] First a photo resist layer 350 is formed on the chip 310. After the photo resist layer 350 has been exposed and developed, a pattern (not shown) is transferred to the photo resist layer 350 so that at least an opening 352 (only one opening is shown), which exposes bonding pad 316, is formed in the photo resist layer 350. An activation step is followed to form a medium layer 328, zinc, on the bonding pad 316 of the chip 310. Then a bump body 320, nickel, is formed on the medium layer 328 inside the opening by electricless plating.

[Para 31] With reference to Fig. 8 and Fig. 9, the photo resist layer 350 is removed form the surface of the chip 310.

[Para 32] With reference to Fig. 10, finally, a step of producing a bump body passivation layer is performed. A bump body passivation layer 330, gold is formed to cover the bump body 320 except for a portion of the bump body 320 that connects to the medium layer 328.

[Para 33] With reference to Fig. 8, since the bump body 320 is formed inside the opening 352, the shape of the bump body 320 can be controlled by the shapes of the openings 352. Accordingly, the bump body 320 can be formed higher than that in the previous embodiment.

[Para 34] As it is described above, the structure and the fabricating process of the bump in the present invention can simplify the bumping process and can reduce the manufacturing cost.

[Para 35] While the present invention has been described with 2 preferred embodiments, these descriptions are not intended to limit our invention. Various modifications of the embodiments will be apparent to those skilled in the art. It is therefore contemplated that the appended claims will cover any such modifications or embodiments as fall within the true scope of the invention.